



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
-----------------	-------------	----------------------	---------------------	------------------

10/521,871

01/21/2005

Norihisa Mino

10873.1596USWO

1262

52835

7590

02/13/2009

HAMRE, SCHUMANN, MUELLER & LARSON, P.C.

P.O. BOX 2902

MINNEAPOLIS, MN 55402-0902

EXAMINER

ONEILL, KARIE AMBER

ART UNIT

PAPER NUMBER

1795

MAIL DATE

DELIVERY MODE

02/13/2009

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

DETAILED ACTION

Response to Amendment

1. The Applicant's amendment filed on November 17, 1008, was received. Claims 1, 3, 6, 12, 14, 17, 20, 25, 26, 31 and 32 have been amended. Claims 10, 15, 16 and 27-29 have been cancelled. Claims 34 and 35 have been added as new. Therefore, Claims 1-9, 11-14, 17-26 and 30-33 are pending in this office action.
2. The text of those sections of Title 35, U.S.C. code not included in this action can be found in the prior Office Action issued on August 18, 2008.

Election/Restrictions

3. Newly submitted claim 34 is directed to an invention that is independent or distinct from the invention originally claimed for the following reasons:

The subject matter of the aforementioned claim is to "an electrolyte membrane having ionic conductivity, the electrolyte membrane comprising: a substance, the substance being a polymer of at least one type of inorganic materials", which is a distinct species from the "an electrolyte membrane having ionic conductivity, the electrolyte membrane comprising: a water repellent substance" as recited in the original claim. The species are distinct because a polymer of inorganic materials is a distinct type of electrolyte in the art that does not require a water repellent substance, while an electrolyte membrane comprising a water repellent substance does not require a polymer of inorganic materials. Since the identity of the electrolyte is different, the

Art Unit: 1795

search and examination of each species requires an undue burden on the examiner. It is well-known in the art that different types of fuel cells are classified by the type of electrolyte found in the fuel cell.

Since applicant has received an action on the merits for the originally presented invention, this invention has been constructively elected by original presentation for prosecution on the merits. Accordingly, claim 67 is withdrawn from consideration as being directed to a non-elected invention. See 37 CFR 1.142(b) and MPEP § 821.03.

4. Newly submitted claim 35 is directed to an invention that is independent or distinct from the invention originally claimed for the following reasons: The subject matter of the aforementioned claim is to “an electrolyte membrane having ionic conductivity, the electrolyte membrane comprising: a substance, the substance being a polymer of at least one material selected from styrene, divinylbenzene, and methyl methacrylate, and at least one part of the selected material may be substituted with fluorine”, which is a distinct species from the “an electrolyte membrane having ionic conductivity, the electrolyte membrane comprising: a water repellent substance” as recited in the original claim. The species are distinct because a polymer of at least one material selected from styrene, divinylbenzene, and methyl methacrylate, and at least one part of the selected material may be substituted with fluorine is a distinct type of electrolyte that does not require a water repellent substance, while an electrolyte membrane comprising a water repellent substance does not require a polymer of these materials. Since the identity of the electrolyte is different, the search and examination of

Art Unit: 1795

each species requires an undue burden on the examiner. It is well-known in the art that different types of fuel cells are classified by the type of electrolyte found in the fuel cell.

Since applicant has received an action on the merits for the originally presented invention, this invention has been constructively elected by original presentation for prosecution on the merits. Accordingly, claim 67 is withdrawn from consideration as being directed to a non-elected invention. See 37 CFR 1.142(b) and MPEP § 821.03.

Claim Rejections - 35 USC § 102

5. The rejection of Claims 1-9, 12, 21-26 and 28-33 under 35 U.S.C. 102(b) as being anticipated by Yamaguchi (JP 2002-083612), have been overcome based on the amendments to the claims and the arguments presented on pages 9-10 of the Remarks dated November 17, 2008.

6. Claims 1-5, 7, 9, 12, 17-26 and 30-32 are rejected under 35 U.S.C. 102(b) as being anticipated by Suzuki (JP 2002-203576).

With regard to Claim 1, Suzuki discloses in Drawings 1 and 2, an electrolyte membrane having ionic conductivity, the electrolyte membrane (10) comprising: a porous base material (12), and organic molecules containing ion exchange groups; wherein the organic molecules are chemically bonded to a surface of the base material (12) to form an organic layer (14), wherein ions are conducted via the ion exchange groups in the organic layer, wherein a plurality of through holes (12a) that pierce the porous membrane (12) in a direction perpendicular to a surface of the porous

Art Unit: 1795

membrane are formed in the porous membrane (paragraphs 0024-0027); the organic molecules (14) are chemically bonded to an inner surface of the through holes (12a) and form the organic layer (paragraph 0037), and in the through-holes (12a) a water repellent substance is further provided on the face of the organic layer on a side opposite to a face that is bonded to the base material (12), and the substance fills gaps present in an inner portion of the through holes (12a) (paragraph 0028). The catalyst bed 944a) is formed on the face the organic layer on a side opposite to the face bonded to the base material and includes a catalyst material (48a) made of platinum or a platinum alloy, which is a water repellent material (paragraph 0057).

With regard to Claim 2, Suzuki discloses wherein the ion exchange groups include at least one type of functional group selected from sulfonic acid, carboxylic acid, phosphonic acid and phosphonous acid groups (paragraph 0040).

With regard to Claim 3, Suzuki does not disclose wherein the molecular weight of the organic molecules is 10,000 at most. However, such properties are inherent, given that both Suzuki and the instant application utilize the same materials. A reference which is silent about a claimed invention's features is inherently anticipatory if the missing feature is necessarily present in that which is described in the reference. See MPEP 2112.

With regard to Claims 4 and 5, Suzuki discloses wherein the organic molecules (14) are chemically bonded to the surface of the base material (12) by a coupling agent and wherein at least one of the organic molecules is chemically bonded to an adjacent organic molecule (paragraphs 0041-0046).

With regard to Claim 7, Suzuki discloses, wherein the organic layer is a monolayer (paragraph 0102).

With regard to Claim 9, Suzuki discloses wherein the base material has at least one form selected from particles or fibers forming alumina filter paper, and wherein the electrolyte membrane includes an amalgamation of the base material which is penetrated with the ion conductivity substance (paragraph 0101).

With regard to Claim 12, Suzuki discloses in Drawing 1, wherein a surface of the base material (12) and the surface of the electrolyte membrane are perpendicular to each other because the surface of the base material is located in the communication holes (12a) which is penetrated at a right angle through the base material.

With regard to Claims 17-20, Suzuki discloses in paragraphs 0032-0035, the cross sectional area of the through holes (12a) that are cut in a direction that is parallel to the surface of the porous membrane (12) changes in the thickness direction of the porous membrane and contain fine holes that are open on both ends and connected to the through holes and surface of the membrane. For example, Suzuki discloses the communicating hole (12a) penetrating in the thickness direction of the base material (12) and the shape can be any of an angle below 90 degrees to the field of the film base material. The communicating hole (21a) can be a zigzag shape, circular, ellipse, a polygon and connects to the surface of the membrane or through holes in the shape of a gourd or star.

With regard to Claims 21-23, Suzuki discloses the base material being any of a polymer material, inorganic material and a complex of inorganic and organic material,

Art Unit: 1795

which means that the base material may be a plurality of base materials (paragraph 0036). Specifically, the base material is an alumina membrane (paragraphs 0036, 0101).

With regard to Claims 24-26, Suzuki does not disclose wherein the specific surface area per unit volume of base material is at least $100 \text{ m}^2/\text{cm}^3$, wherein when the porosity of the base material is ε (volume %) and an average diameter of the through holes is d (nm), ε and d satisfy the relationship given by $(4 \times \varepsilon)/d > 10$, and wherein when the porosity of the base material is ε (volume %) and an average tortuosity of the through holes is τ , ε and τ satisfy the relationship given by $\varepsilon/\tau^2 < 20$. However, such properties are inherent, given that both Suzuki and the instant application utilize the same materials. A reference which is silent about a claimed invention's features is inherently anticipatory if the missing feature is necessarily present in that which is described in the reference. See MPEP 2112.

With regard to Claims 30-32, Suzuki discloses in Drawing 2, a fuel cell (20), comprising: an electrolyte membrane (30); a cathode electrode (40b); and an anode electrode (40a); wherein the electrolyte membrane (30) is held between the cathode electrode (40b) and the anode electrode (40a); and further comprising a fuel supply portion to supply fuel to the anode electrode, and an oxidizing agent supply portion to supply an oxidizing agent to the cathode electrode, wherein the fuel includes at least one type of gas selected from hydrogen (paragraphs 0052-0059).

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. Claims 6, 8 and 33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Suzuki (JP 2002-203576), as applied to Claims 1-5, 7, 9, 12, 17-26 and 30-32 above, and in further view of Yamaguchi (JP 2002-083612).

Suzuki discloses the electrolyte membrane in paragraph 5 above, but does not disclose wherein a thickness of the organic layer is in a range of at least 0.1nm to at most 500nm, wherein the organic layer is a bilayer or multi-layer that includes a structure in which a plurality of monolayers are built-up, and wherein the fuel includes methanol.

With regard to Claims 6 and 8, Yamaguchi discloses an electrolyte membrane comprising: a porous base or substrate material (1), and organic molecules (3) containing ion exchange groups, called a 1st polymer; wherein the organic molecules (3) are chemically bonded to the surface of the base material (1) to form an organic layer, the surface of the base material being the inner surface of the pores (2), and wherein ions are conducted via the ion exchange groups in the organic layer. Yamaguchi discloses wherein the thickness of the organic layer, made up of the substrate (1) and the organic molecules (3), is 100 micrometers or less (paragraph

Art Unit: 1795

0035), which encompasses the range of at least 0.1 nm to at most 500nm. Yamaguchi also discloses wherein the organic layer is a monolayer, or more than two layers may be used when using a composite material (paragraph 0034).

Therefore, at the time of the invention, it would have been obvious to one of ordinary skill in the art to use an organic layer with a thickness in the range of 0.1nm to 500nm, and it would have been obvious to one of ordinary skill in the art for the organic layer to be a bilayer or multilayer in the electrolyte membrane of Suzuki, because Yamaguchi teaches increasing proton conductivity by controlling the crossover of methanol by using a polymer organic layer with such thicknesses and in multiple layers (paragraph 0056).

With regard to Claim 33, Yamaguchi discloses in Drawings 4 and 5, a fuel cell (11), comprising: an electrolyte membrane (17); a cathode electrode (13); and an anode electrode (15); wherein the electrolyte membrane (17) is held between the cathode electrode (13) and the anode electrode (15); and further comprising a fuel supply portion to supply fuel to the anode electrode, and an oxidizing agent supply portion to supply an oxidizing agent to the cathode electrode, wherein the fuel includes at least one type of gas or liquid selected from hydrogen or a hydrocarbon, specifically the fuel being methanol (paragraphs 0060-0064). Therefore, at the time of the invention, it would have been obvious to one of ordinary skill in the art to use methanol as the fuel in Suzuki, because Yamaguchi teaches that gaseous hydrogen as well as hydrogen formed from a hydrocarbon or methanol are functional equivalents known in the art as fuels for fuel cell power generation.

9. Claims 11 and 13-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Suzuki (JP 2002-203576), as applied to Claims 1-5, 7, 9, 12, 17-26 and 30-32 above, and in further view of Yamada (US 5,213,910).

Suzuki discloses an electrolyte membrane in paragraph 5 above, but does not disclose wherein the base material has a folded film shape, the base material is wound up, and the base material is folded into an accordion shape.

Yamada discloses in Figures 8-10, a solid electrolyte type fuel cell including two plate-shaped solid electrolyte type fuel cell elements formed with a plurality of recesses, a three layer structure (11, 21, 31) consisting of a fuel electrode film (12, 22, 32), a solid electrolyte film (13, 23, 33) and an air electrode film (14, 24, 34) provided with a trapezoid cross-section or a folded film shape (Fig. 8), formed as a whole wave-shaped element or being wound (Fig. 9) and formed in a zigzag or accordion fashion (Fig. 10) (column 6 lines 59-65, column 7 lines 15-16, 24-25).

Therefore, at the time of the invention, it would have been obvious to one of ordinary skill in the art to use a base material of the electrolyte membrane of Suzuki in a folded shape, wound up and in an accordion shape, because Yamada teaches that fuel, oxidant and temperature distribution is uniform allowing the fuel cell to operate for a longer period of time and improve the electric power generating efficiency (column 8 lines 11-17).

Response to Arguments

10. Applicant's arguments filed November 17, 2008, have been fully considered but they are not persuasive.

Applicants primary arguments are that in the Suzuki reference, “the hydrophobic layer of the reference is provided between the catalyst layer and the diffusion layer and is not provided on the organic layer formed on an inner surface of the base material, i.e., the hydrophobic layer is not facing an inner portion of the through holes” and “the water repellent substance be provided within the through holes formed in the base material and on a side of the organic layer facing an inner side of the through hole and that the water repellent substance fill gaps in the inner portion of the through holes”.

In paragraph 4 above, the rejection discloses that what Suzuki calls “the hydrophobic layer” is not necessarily what is intended to be “the water repellent substance” when applying the reference to the instant claims. Suzuki discloses a catalyst bed (44a) containing a catalyst material (48a) made of platinum or platinum alloy, formed on the surface of the base material (12). The platinum material is a hydrophobic or water repellent material that will seep into the through holes (12a) of the base material (12). Therefore, Suzuki meets the claimed limitations.

Conclusion

11. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP

Art Unit: 1795

§ 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Karie O'Neill whose telephone number is (571)272-8614. The examiner can normally be reached on Monday through Friday from 8am to 5pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick Ryan can be reached on (571) 272-1292. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 1795

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Mark Ruthkosky/
Primary Examiner, Art Unit 1795

Karie O'Neill
Examiner
Art Unit 1795

KAO